XIX. *Obſervations on the Sugar Ants. In a Letter from* John Caſtles, *Eſq. to Lieut. Gen.* Melvill, *F. R. S.*

Read May 22, 1790.

THE Sugar Ants, ſo called from their ruinous effects on the ſugar-cane, firſt made their appearance in Grenada about twenty years ago on a ſugar plantation at Petit Havre, a Bay five or ſix miles from the town of St. George, the capital, conveniently ſituated for ſmuggling from Martinique. It was therefore concluded, they were brought from thence in ſome veſſel employed in that trade; which is very probable, as colonies of them in like manner were afterwards propagated in different parts of the iſland by droghers, or veſſels employed in carrying ſtores, &c. from one part of the iſland to another.

From thence they continued to extend themſelves on all ſides, for ſeveral years; deſtroying in ſucceſſion every ſugar plantation between St. George's and St. John's, a ſpace of about twelve miles. At the ſame time, colonies of them began to be obſerved in different parts of the iſland, particularly at Duqueſne on the north, and Calavini on the ſouth ſide of it.

All attempts of the planters to put a ſtop to the ravages of theſe inſects having been found ineffectual, it well became the legiſlature to offer great public rewards to any who ſhould diſcover a practicable method of deſtroying them, ſo as to permit the cultivation of the ſugar-cane as formerly. Accordingly,

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an Act was paſſed, by which ſuch diſcoverer was entitled to twenty thouſand pounds, to be paid from the public treaſury of the iſland.

Many were the candidates on this occaſion, but very far were any of them from having any juſt claim: nevertheleſs, conſiderable ſums of money were granted, in conſideration of trouble and expences in making experiments.

In Grenada there had always been ſeveral ſpecies of ants, differing in ſize, colour, &c. which however were perfectly innocent with reſpect to the ſugar-cane. The ants in queſtion, on the contrary, were not only highly injurious to it, but to ſeveral ſorts of trees, ſuch as the lime, lemon, orange, &c.

Theſe ants are of the middle ſize, of a ſlender make, of a dark red colour, and remarkable for the quickneſs of their motions; but their greateſt peculiarities were, their taſte when applied to the tongue, the immenſity of their number, and their choice of places for their neſts.

All the other ſpecies of ants in Grenada have a bitter muſky taſte. Theſe, on the contrary, are acid in the higheſt degree, and, when a number of them were rubbed together between the palms of the hands, they emitted a ſtrong vitriolic ſulphureous ſmell; ſo much ſo, that, when this experiment was made, a gentleman conceived, that it might be owing to this quality that theſe inſects were ſo unfriendly to vegetation. This criterion to diſtinguiſh them was infallible, and known to every one.

Their numbers were incredible. I have ſeen the roads coloured by them for miles together; and ſo crowded were they in many places, that the print of the horſes feet would appear for a moment or two, till filled up by the ſurrounding multitude. This is no exaggeration. All the other ſpecies of ants, although numerous, were circumſcribed and confined to a ſmall ſpot, in proportion to the ſpace occupied by the cane ants, as a mole hill to a mountain.

The common black ants of that country had their neſts about the foundation of houſes or old walls; others in hollow trees; and a large ſpecies, in the paſtures, deſcending by a ſmall aperture under ground. The ſugar ants, I believe, univerſally conſtructed their neſts among the roots of particular plants and trees, ſuch as the ſugar-cane, lime, lemon, and orange trees, &c.

The deſtruction of theſe ants was attempted chiefly two ways; by poiſon and the application of fire.

For the firſt purpoſe arſenic and corroſive ſublimate, mixed with animal ſubſtances, ſuch as ſalt fiſh, herrings, crabs, and other ſhell-fiſh, &c, were uſed, which was greedily devoured by them. Myriads of them were thus deſtroyed; and the more ſo, as it was obſerved by a magnifying glaſs, and indeed (though not ſo diſtinctly) by the naked eye, that corroſive ſublimate had the effect of rendering them ſo outrageous that they deſtroyed each other; and that effect was produced even by coming into contact with it. But it is clear, and it was found, that theſe poiſons could not be laid in ſufficient quantities over ſo large a tract of land, as to give the hundred-thouſandth part of them a taſte, and conſequently they proved inadequate to the taſk.

The uſe of fire afforded a greater probability of ſucceſs; for (from whatever cauſe) it was obſerved, that if wood, burnt to the ſtate of charcoal, without flame, and immediately taken from the fire, was laid in their way, they crowded to it in ſuch amazing numbers as ſoon to extinguiſh it, although with the deſtruction of thouſands of them in effecting it. This part of their

their hiſtory appears ſcarcely credible; but, on making the experiment myſelf, I found it literally true. I laid fire, as above deſcribed, where there appeared but a very few ants, and in the courſe of a few minutes thouſands were ſeen crowding to it and upon it, till it was perfectly covered by their dead bodies. Holes were therefore dug at proper diſtances in a cane piece, and fire made in each of them. Prodigious quantities periſhed in this way; for thoſe fires, when extinguiſhed, appeared in the ſhape of mole hills, from the numbers of their dead bodies heaped on them. Nevertheleſs they ſoon appeared again as numerous as ever. This may be accounted for, not only from their amazing fecundity, but that probably none of the breeding ants, or young brood, ſuffered from the experiment.

For the ſame reaſon, the momentary general application of fire by burning the cane traſh (or ſtraw of the cane) as it lay on the ground, proved as little effectual; for although, perhaps, multitudes of ants might have been deſtroyed, yet in general they would eſcape by retiring to their neſts under cover, and out of its reach, and the breeding ants, with their young progeny, muſt have remained unhurt.

Mr. SMEATHMAN (who wrote a Paper on the Termites, or White Ants, of Africa, and was at Grenada at this time) imagined, that theſe ants were not the cauſe of the injury done to the canes. He ſuppoſed, it was owing to the blaſt, a diſeaſe the canes are ſubject to, ſaid to ariſe from a ſpecies of ſmall flies, generated on their ſtems and leaves; and that the ants were attracted in ſuch multitudes merely to feed on them.

There is no doubt, that where this blaſt exiſted it conſtituted part of the food of the ants: but this theory was overthrown, by obſerving, that by far the greateſt part of the injured canes had no appearance of that ſort, but became ſickly and withered,

withered, apparently for want of nouriſhment. Beſides, had that been the caſe, the canes muſt have been benefited inſtead of being hurt by theſe inſects.

For the cure of the blaſt, he propoſed the application of train oil, which had not the leaſt effect in preventing the miſchief, and, if it had, could never have been generally enough uſed to anſwer the purpoſe.

This calamity, which reſiſted ſo long the efforts of the planters, was at length removed by another, which, however ruinous to the other iſlands in the Weſt Indies, and in other reſpects, was to Grenada a very great bleſſing, namely, the hurricane in 1780; without which it is probable the cultivation of the ſugar-cane in the moſt valuable parts of that iſland muſt have in a great meaſure been thrown aſide, at leaſt for ſome years. How this hurricane produced this effect has been conſidered rather as a matter of wonder and ſurprize than attempted to be explained. By attending to the following obſervations, the difficulty I believe will be removed.

Theſe ants make their neſts, or cells for the reception of their eggs, only under or among the roots of ſuch trees or plants as are not only capable of protecting them from heavy rains, but are at the ſame time ſo firm in the ground as to afford a ſecure baſis to ſupport them againſt any injury occaſioned by the agitation of the uſual winds. This double qualification the ſugar-cane poſſeſſes in a very great degree; for a ſtool of canes (which is the aſſemblage of its numerous roots where the ſtems begin to ſhoot out) is almoſt impenetrable to rain, and is alſo, from the amazing numbers and extenſion of the roots, firmly fixed to the ground. Thus, when every other part of the field is drenched with rain, the ground under thoſe ſtools will be found quite dry, as I and every other planter muſt have obſerved when digging out the ſtools in a cane piece, to prepare for replanting. And when canes are lodged or laid down by the uſual winds, or from their own luxuriancy, the ſtools commonly remain in the ground; hence, in ordinary weather, their neſts are in a ſtate of perfect ſecurity.

The lime, lemon, orange, and ſome other trees, afford theſe inſects the ſame advantages, from the great number and quality of their roots, which are firmly fixed to the earth, and are very large; beſides which, their tops are ſo very thick and umbrageous as to prevent even a very heavy rain from reaching the ground underneath.

On the contrary, theſe ants neſts are never found at the roots of trees or plants incapable of affording the above protection: ſuch, for inſtance, is the coffee-tree. It is indeed ſufficiently firm in the ground, but it has only one large tap root, which goes ſtraight downwards, and its lateral roots are ſo ſmall as to afford no ſhelter againſt rain. So again, the roots of the cotton ſhrub run too near the ſurface of the earth to prevent the acceſs of rain, and are neither ſufficiently permanent, nor firm enough to reſiſt the agitation by the uſual winds. The ſame obſervation will be found true with reſpect to cocao, plantains, *maize*, tobacco, indigo, and many other ſpecies of trees and plants.

Trees or plants of the firſt deſcription always ſuffer more or leſs in lands infeſted with theſe ants; whereas thoſe of the latter never do. Hence we may fairly conclude, that the miſchief done by theſe inſects is occaſioned only by their lodging and making their neſts about the roots of particular trees or plants. Thus the roots of the ſugar-canes are ſomehow or other ſo much injured by them, as to be incapable of performing their office of ſupplying due nouriſhment to the plants, which therefore become ſickly and ſtinted, and conſequently do not afford juices fit for making ſugar in either tolerable quantity or quality.

That theſe ants do not feed on any part of the canes or trees affected ſeems very clear, for no loſs of ſubſtance in either the one or the other has ever been obſerved; nor have they ever been ſeen carrying off vegetable ſubſtances of any ſort. The truth of this will farther appear by the following fact.

A very fine lime-tree, in the paſture of Mount William eſtate, at a conſiderable diſtance from any canes, but near the dwelling houſe, had ſickened and died ſoon after the ants made their appearance on that eſtate. After it had remained in that ſtate, without a ſingle leaf, or the leaſt verdure, for ſeveral months, on examination, a very few ants appeared about it; but when with the manager's permiſſion it was grubbed out, a moſt aſtoniſhing quantity of ants and ants neſts, full of eggs, were found about its roots, all of which were quite dead, and many of them rotten.

That this tree conſtituted no part of their food is quite certain; but, while it continued to afford them proper ſecurity for their neſts, they ſtill continued their abode.

On the contrary, there is the greateſt preſumption that theſe ants are carnivorous, and feed entirely on animal ſubſtances; for if a dead inſect, or animal food of any ſort, was laid in their way, it was immediately carried off. It was found almoſt impoſſible to preſerve cold victuals from them. The largeſt carcaſſes, as ſoon as they began to become putrid, ſo as that they could ſeparate the parts, ſoon diſappeared. Negroes with ſores had difficulty to keep the ants from the edges of them. They deſtroyed all other vermin, rats in particular, of which they cleared every plantation they came upon, which they probably effected

effected by attacking their young. It was found that poultry, or other ſmall ſtock, could be raiſed with the greateſt difficulty; and the eyes, noſe, and other emunctories of the bodies of dying or dead animals were inſtantly covered with them.

In the year 1780, many of the ſugar eſtates which had been firſt infeſted with theſe ants had been either abandoned, or put into other kinds of produce, principally cotton; which, as I have above obſerved, do not afford conveniency for their neſts. In conſequence, the ants had there ſo much decreaſed in number, that the cultivation of ſugar had again begun to be re-aſſumed. But it was very different in thoſe plantations which had but lately been attacked, and were ſtill in ſugar. At Duqueſne, particularly, at that time they were pernicious in the higheſt degree, ſpreading themſelves on all ſides with great rapidity, when a ſudden ſtop was put to their progreſs by the hurricane which happened near the middle of October that year. How this was effected, I think, may be explained by attending to the above obſervations.

From what has been ſaid it appears, that a dry ſituation, ſo as to exclude the ordinary rains from their neſts or cells, appropriated for the reception of their eggs or young brood, is abſolutely neceſſary; but that theſe ſituations, however well calculated for the uſual weather, could not afford this protection from rain during the hurricane, may be eaſily conceived.

When by the violence of the tempeſt heavy pieces of artillery were removed from their places, and houſes and ſugar-works levelled with the ground, there can be no doubt that trees and every thing growing above ground muſt have greatly ſuffered. This was the caſe. Great numbers of trees and plants (which reſiſt commonly the ordinary winds) were torn out by the root. The canes were univerſally either lodged or twiſted about as if by a whirlwind, or torn out of the ground altogether. In the latter caſe, the breeding ants, with their progeny, muſt have been expoſed to inevitable deſtruction from the deluge of rain which fell at the ſame time. The number of canes, however, thus torn out of the ground, could not have been adequate to the ſudden diminution of the ſugar ants; but it is eaſy to conceive, that the roots of canes which remained on the ground, and the earth about them, were ſo agitated and ſhaken, and at the ſame time the ants neſts were ſo broken open, or injured, by the violence of the wind, as to admit the torrents of rain accompanying it. I apprehend, therefore, that the principal deſtruction of theſe ants muſt have been thus effected.

Two circumſtances tended to facilitate this happy effect. Many of the roots of the canes infected, as above obſerved, were either dead or rotten, ſo as not to be capable of making the ſame reſiſtance to the wind as thoſe in perfect health. And this hurricane happened ſo very late as the month of October, when the canes are always ſo high above ground as to give the wind ſufficient hold of them, which at an earlier period would not have been the caſe.

That many of the cane ants were ſwept off by the torrents of rain into the rivers and ravines, and thus periſhed, I have no doubt; but if we conſider the obſtacles to this being very general, it could have had but ſmall effect in conſiderably reducing their numbers; for on flat land it could not have happened. In hanging or hilly land, the cane traſh would afford great ſhelter, and the ants would naturally retire to their neſts for ſecurity, when they found their danger.

Some have ſuppoſed, that the ſugar ants, after a certain time, degenerate, and become inoffenſive; and in proof of this, they ſay, Martinique and Barbadoes were freed from their bad effects without a hurricane or any other apparent cauſe.

The idea of any ſuch extraordinary and unheard-of deviation of nature is too contemptible to deſerve an anſwer; but the reaſon is obvious. The planters there either abandoned their cane lands, or planted them in coffee, cocao, cotton, indigo, &c. none of which, according to the above obſervations, afford the ants proper conveniency for the propagation of their ſpecies; and therefore their numbers muſt have ſo much decreaſed as to re-admit the culture of the ſugar-cane as before. At the ſame time it is very probable, that this diminution might have in part been owing to ſomething of the hurricane kind; for it is well known, that ſtrong ſqualls of wind, attended with heavy rains, are frequent in the Weſt Indies, although they do not laſt ſo long, nor are ſo violent, as to deſerve the name of a hurricane.

It muſt not however be denied, that though nature, for a time, may permit a particular ſpecies of animal to become ſo unproportionably numerous as to endanger ſome other parts of her works, ſhe herſelf will in due time put a check upon the too great increaſe; and that is often done by an increaſe of ſome other animal inimical to the former deſtroyers. In the preſent caſe, however, nothing of that ſort appeared; therefore, when a plain natural cauſe, obvious to our ſenſes, occurred, by which we can account for the amazing and ſudden decreaſe of thoſe ruinous inſects, it is unneceſſary to recur to other poſſible cauſes, too minute for our inveſtigation.

All I have ſaid on this ſubject would certainly be of little or no conſequence, did it not lead to the true method of cultivating the ſugar-cane on lands infeſted with thoſe deſtructive

inſects;

inſects; in which point of view, however, it becomes important.

If then the above doctrine be juſt, it follows, that the whole of our attention muſt be turned to the deſtruction of the neſts of theſe ants, and conſequently the breeding ants with their eggs or young brood.

In order to effect this, all trees * and fences, under the roots of which theſe ants commonly take their reſidence, ſhould firſt be grubbed out; particularly lime fences, which are very common in Grenada, and which generally ſuffered from the ants before the canes appeared in the leaſt injured. After which the canes ſhould be ſtumped out with care, and the ſtools burnt as ſoon as poſſible, together with the field traſh (or the dried leaves and tops of the canes), in order to prevent the ants from making their eſcape to new quarters. The beſt way of doing this, I apprehend, will be, to gather the field traſh together in conſiderable heaps, and to throw the ſtools as ſoon as dug out of the ground into them, and immediately apply fire. By this means multitudes muſt be deſtroyed; for the field traſh, when dry, burns with great rapidity. The land ſhould then be ploughed or hoe-ploughed twice (but at leaſt once) in the wetteſt ſeaſon of the year, in order to admit the rains, before it is hoed for planting the cane: by theſe means theſe inſects, I apprehend, will be ſo much reduced in number as at leaſt to ſecure a good plant cane.

But it is the cuſtom in moſt of the Weſt India iſlands to permit the canes to rattoon; that is, after the canes have once been cut down, for the purpoſe of making ſugar, they are

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* Particular fruit trees may probably be preſerved, without detriment, by carefully removing the earth from about their roots, deſtroying the ants neſts, and afterwards replacing either the ſame or new earth.

ſuffered to grow up again, without replanting; and this generally for three or four years, but ſometimes for ten, fifteen, or twenty. In this mode of culture the ſtools become larger every year, ſo as to grow out of the ground to a conſiderable height, and by that means afford more and more ſhelter to the ants neſts; therefore, for two or three ſucceſſive crops, the canes ſhould be replanted yearly, ſo as not only to afford as little cover as poſſible for the ants neſts, but continually to diſturb ſuch ants as may have eſcaped, in the buſineſs of propagating their ſpecies.

That conſiderable expence and labour will attend putting this method into execution, there is no doubt. An expenſive cure, however, is better than none; but from the general principles of agriculture, I am of opinion, that the planter will be amply repaid for his trouble, by the goodneſs of his crops, in conſequence of the ſuperior tilth the land will receive in the propoſed method. Of this we have a proof in the iſland of St. Kitt's, where they conſtantly replant their canes yearly: and it is very well known, that an acre of cane land there gives a greater return than the ſame quantity in any other iſland. In St. Kitt's, five hogſheads *per* acre is common yielding in good land. In Grenada, from two to three hogſheads from plant canes, and half that quantity from rattoons. Thus, although the St. Kitt's planter cuts only one half of his cane land yearly, in a given number of years he makes a greater revenue than the Grenada planter on the preſent mode of rattooning, when four-fifths of the cane land is yearly cut.

Some may be of opinion, that it would be more advantageous to change the produce than to purſue the propoſed method; on which I ſhall only obſerve, that it appears to me, that one half of the uſual crop of ſugar, thus produced, will

will be more advantageous to the planter (when at the ſame time progreſs is making in deſtroying the ſugar ants) than a full crop of any other produce. In ſome very few ſituations cotton perhaps may be excepted. As to coffee, it is to be conſidered that it gives no return till the third year after planting, and not a full crop till the fifth. Cocao begins to bear in five years; but yields little till the ſeventh: and indigo not only exceedingly impoveriſhes the land, but is unhealthy to the negroes. Add to this, that far the greateſt part of ſugar lands are unfit for the culture of any of theſe.

It would carry this Letter to too great a length were I to adduce all that may be ſaid on this ſubject; I ſhall therefore conclude by obſerving, that the beſt proof of the truth of the above doctrine will be the ſucceſs attending the propoſed method of cultivation, or one of the ſame tendency, *viz.* to attempt the deſtruction of the neſts of theſe inſects, and conſequently the breeding ants, with their young broods; for their fecundity appears to be ſo prodigiouſly great as to render it altogether impoſſible to deſtroy them by poiſon, which can never be generally enough uſed to effect that purpoſe.